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PARTIAL LIST OF ROTIFERA OF SHIAWASSEE RIVER AT CORUNNA, MICHIGAN.

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I had the pleasure of a vacation during July last at the place named in the title; among my agreeable companions were my microscope and the appliances of a collector of pond-life, including a few books. It is needless to say that many delightful hours were spent in identifying and observing the habits of the charming little creatures known as Rotifera, or Wheel-animalcules.

The Shiawassee River is one of those uniting to form the better known Saginaw, and flows through the fertile, central part of the lower peninsula and is apparently a fair example of the inland waters of this country. The forms were taken in the tow-net and dipping bottle or attached to weeds in the rippling current or shady nook; some were taken in the swamps and ponds along its borders three miles or more from the town. One of the most productive haunts of these tiny gems was an abandoned shaft of a coal mine from which a stream of cool spring water mingles with the river near by; this miniature pond is filled with water-plants, for example, *Utricularia vulgaris*, *Lemna trisulea*, and *Ranunculus multifidus*. On these or crawling among the entangled Algæ were found many species of the list. It gives me pleasure to note that some of the most interesting species of the group are among the inhabitants of our fresh waters; several of these it will be observed have but recently been made known to science by European students. This list does not include all the wheel-animalcules detected, as I have admitted only such as have been studied carefully, except in a few cases in which I have expressed a doubt and stated the reasons therefor; again it is evident that to prepare more than a very partial catalogue would require study throughout the year and for years ; as a preliminary survey, then, it is submitted.

In several species I have found slight differences compared with the descriptions of authors, yet not enough, in my judgment, to warrant specific separation; however, four species discovered appear to be separable and I have proposed names for them accompanied by brief descriptions.

The impressions left by the brief examination are that the rotiferal fauna of inland America is abundant and that the species are largely identical with those of Europe, even to a greater degree than in case of the Infusoria.

The classification followed is that of *The Rotifera* by Hudson and Gosse. The class, Rotifera, is divided into four orders, viz.: I. Rhizota, II. Bdelloida, III. Ploïma, and IV. Scirtopoda.

ORDER I. FAMILY I. FLOSCULARIDÆ.

Floscularia coronetta, Cubitt.

This, I think, is unquestionably the most beautiful one of its genus thus far identified in this country. It abounds in shaded nooks; and its favorite support appears to be *Utricularia.* It is somewhat partial also to the Characeæ.

Floscularia ornata, Ehrenberg.

Floscularia cornuta, Dobie.

Even more abundant than *Ornata.* I find the flexible process of the dorsal lobe very much longer than the descriptions and figures of the European examples represent it. It often extends to the end of the setæ; the ratio of its length to that of the entire trunk is as 3 : 5.

Floscularia campanulata, Dobie.

This charming rotiferon is considerably larger than the dimensions given by Dr. Hudson; the body longer and the corona relatively narrower than he represents it by a figure; entire length equals $\frac{1}{25}$ inch. It is not common and I have found it in clusters. I have seen the young free from the egg turning about in the cloaca.

Floscularia ambigua, Hudson.

FAMILY 2. MELICERTADÆ.

Melicerta ringens, Schrank.

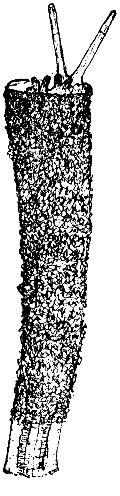
Melicerta conifera, Hudson.

This is a more delightful object, if possible, for examination than the preceding species and is rather more abundant in somewhat shaded and quiet pools. It is almost the rule to find them in small clusters, *i. e.*, several of the younger ones fasten their tubes to that of their parents.

Limnias ceratophylli, Schrank.

Limnias annulatus, Bailey.

This appears to have been the first of the class to be described in America, although it was found and a figure published by Thos. Brightwell in England before Professor Bailey's account and excellent figure appeared with the above name in *Smithsonian Cont. to Knowledge*, Vol. 4, Art. 3, 1852.



Limnias Shiawasseënsis, Sp. Nov.

The two species of tube dwelling Rotifera, *Limnias ceratophylli* and *L. annulatus*, are among the most common and most widely recognized of our forms of the wheel-animalcules. I am now able to add an account of a third which is no less interesting or distinct, but will probably prove to be a rare species; very few could be found in the one locality where it was discovered. It was found on *Myriophyllum* at the border of the river; its congeners were not uncommon in the same situation.

The tube is normal in form, clear below and covered above by dark floccose; the surface is not smooth nor yet annulate, but beset with transverse, parallel rows of minute raised points which serve to hold the floccose which the animal packs against the tube by its dorsal processes.

The coronal discs when acting are not pushed so far above the tube as in the other species — the lower edges just clearing the margin of the tube; the discs are held nearly vertical and the long ventral antennæ stand out considerably higher than the discs and at a sharp angle with the tube.

The antennæ are equal in length to the diameter of the tube, slender, nearly straight and terminated by a slender cone which bears a brush of setæ; when the lobes are withdrawn and the corona is just concealed the antennæ stand up above the tube and the extremity and brush of setæ are then seen to be invaginated.

The corneous denticles on the dorsal surface are seven in number; in the middle line just below the dorsal-gap there are two arising from a common base, their apexes are obtuse; on each side of these, a little lower, is another with obtuse apex, this pair points obliquely upward toward the uppermost pair; below these, wider apart, are two more, broad and set obliquely; below this pair, near the middle line, is another pair, broad and set obliquely. The cloaca may be seen thrust up to the rim of the tube between these processes to discharge the fæces.

The ciliated lobes are normal; the ratio of dimensions is as follows: length of antennæ and width of tube 10, vertical height of lobes 9, transverse width of expanded lobes 20. The chin is broad and fills the space between the divergent antennæ; it is obscurely lobed at its apex. The mastax is made up of three clear, confluent globules in which the trophi, apparently malleo-ramate, are lodged.

The species is sufficiently separated from *Annulatus* which it resembles by the very much longer antennæ, by the differences of the horny processes and by the character of the tube.

Figure I shows the animal in the attitude it assumes when disturbed or hesitating to expand its corona; the long antennæ then stand up rigidly with the conical apex and its brush of setæ withdrawn or invaginated.

Cephalosiphon limnias, Ehrenberg.

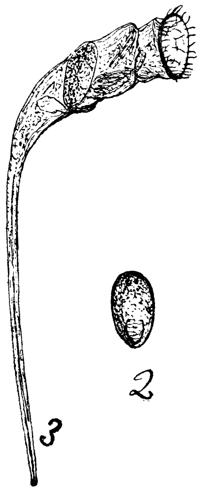
It was abundant on *Myriophyllum* in the river two years ago, when I had the opportunity to hunt and admire it. This year it is exceedingly scare in the same locality which is, apparently, unchanged.

Œcistes crystallinus, Ehrenberg.

It was found abundant and is much smaller than the size given by Hudson and Gosse, $\frac{1}{38}$ inch.

I have several times found an Œcistes which by its stout, conical, ventral antennæ, which are wide apart and bear a dense brush of setæ, would seem to belong near *Crystallinus*, but it is much larger and wholly without tube; the long, strongly wrinkled foot and the corona are characters very much like *Œ. ptygura.*

Œcistes mucicola, Sp. Nov.



The interesting rotiferon for which I propose the characteristic specific name *Mucicola* was found in abundance in a quiet pool exposed to the sun and in which great quantities of the gelatinous thalli of Nostochaceæ and Rivulariaceæ abounded. The species of Œcestes inhabit tubes which are extremely variable, *e. g.*, *Intermedius* has a tube resembling that of *Limnias ceratophylli*, in case of *Brachiatus* it is gelatinous, in that of *Pilula* it is made of fæcal pellets, while that of *Serpentinus* is floccose or nearly wanting, and with *Velatus* it is entirely absent. The species here described adds another variety, in as much as it dwells in tubes made in the mucilaginous matrix of the common Alga *Gloiotricha pisum* in a manner precisely similar to that of *Floscularia algicola.* The little globules of the Alga were plentifully attached to the dissected leaves of *Myriophyllum* ; in nearly all, one or more of the parasites were lodged and in some several found shelter. These when protruding their ciliated discs from the surface of the balls gave them a truly animated and beautiful appearance. Among its associates were *Floscularia ornota* on the same weed with the *Gloiotricha*, and *Copeus labiatus* crawling among the entangled filamentous Algæ.

The corona is small, *i. e.*, but slightly wider than the body and nearly circular, the cilia are long and powerful ; one minute dorsal denticle just below the corona. The elongate, slightly brown body is arched when the cilia are displayed. there is a well-marked constriction or articulation opposite the mastax which is normal ; the cloaca opens at the lower third by a fold that appears to act like a lid. The attenuate foot is smooth when fully extended and from twice to thrice as long as the body ; when strongly contracted it becomes as thick as the body ; it terminates in a short, smooth, pedicle-like extension which also terminates in fibres which attach it to the firm mucilage of the alga.

There is no apparent tube ; the foot is usually attached near the center of the small masses and the disc pushed out beyond the surface. It is an exceedingly sensitive species, retiring to shelter at the least noise or shock. The attitude, when extended, is that of a curve backward, but it is prone to throw its long flexible body into different curves and positions.

The eggs may be seen in the jelly, often several at a time. The shape is long-ovate ; length $\frac{1}{375}$ of an inch, width, $\frac{1}{866}$; they are smooth, colorless ; before hatching, the two red eyes are very conspicuous, at the smaller end the short, wide, wrinkled foot may also be seen. The young when it first leaves the egg is a long, worm-like creature, the foot part being quite short.

Although I have studied it under excellent definition by a homogeneous immersion objective, I could not make out a ventral antenna.

The body of the animal resembles somewhat that of *Serpentinus*. But aside from the character of its habitat, there are well-marked differences, for example : instead of two dorsal hooks below the corona there is one corneous tooth not at all hooked ; the foot is not thick when extended nor wrinkled but attenuate and smooth ; its manners are not similar to those of *Serpentinus* as described by Mr. Gosse, and the eggs are of decidedly different shape and color.

Figure 2 represents the egg. Figure 3 the animal protruded from the alga.

Œcistes longicornis, Davis.

So far as my hunting shows it is a rare form. The tubes of those found at Corunna were not irregular as those of England are represented to be, but, while made of brown floccose, they were compact more or less bent cylinders, *i. e.*, it is shaped to suit the attitude of the animal as it throws back its active wheel in order to bring the "funnel" and long antennæ out of the tube. I saw one tube forked so as to have two openings at the top ; perhaps the weed to which it was fastened had been turned over, causing a face about on the part of *Longicornis*. There are two conspicuous frontal hooklets like those of the *Brachiatus*.

Lacinularia socialis, Ehrenberg.

ORDER II. FAMILY 3. PHILODINADÆ.

Philodina roseola, Ehrenberg.
Philodina aculeata, Ehrenberg.
Rotifer vulgaris, Schrank.
Rotifer tardus, Ehrenberg.

Rotifer macroceros, Gosse.
Rotifer macrurus, Schrank.
Callidina socialis, *Sp. Nov.*

Corona relatively wide; spurs long and stout; teeth two. Parasitic on the limbs and dorsal folds of the depressed larva of the beetle, *Psephenus Lecontei.*

I own that it takes more than a little courage to announce another species of Philodinadae that has no more distinctive features than many already regarded as species. But I have carefully compared the points of difference between it and its congeners, and I find as marked separation as in other examples.

It is a slender, elongate, form; when the body is fully extended its length equals $\frac{1}{65}$ of an inch; in this situation the width of the corona considerably exceeds that of the body. Its appearance and behavior are in strict accord with others of the family. It is so mercurial that much patience was found necessary in determining the characters. Many examples of the larva were examined, every one of which was infested by the rotiferon; often scores were witnessed clinging in groups. Soon after the host was put into the live box they would begin to creep about and finally detach themselves and swim away very swiftly.

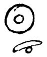
The body is transparent, without color, except the light brown of the stomach, apparently imparted by the contents of that hue. The longitudinal flutings of the trunk and the transverse folds above and below these are conspicuous. The column is thick and ciliated. The dorsal antenna is short, terminated by many minute, pointed elevations bearing setæ, which have been traced to a length equal, at least, to the antenna. The contractile vesicle was not observed. The viscera appear to be similar to others of the group.

I have called this species a *Callidina*, for the reason that it has not a sign of an eye in old or young. I cannot regard it identical with *Parasitica* although its spurs and habits are similar because its corona is relatively wider and freely expanded, its antenna does not end in three lobes and bears setæ plainly visible, its color is not that given by Mr. Gosse for *Parasitica,* and while it was, during July last*, very numerous on the larva mentioned above as its host, not one could be found on *Gammarus* taken at the same time and place.

ORDER III. FAMILY 6. ASPLANCHNADÆ.

Sacculus viridis, Gosse.

Not at all common.



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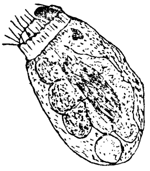

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Sacculus hyalinus, Sp. Nov.

This "bonnie gem" was discovered among *Utricularia* and *Lemna* in a small pond shaded by alders and swamp maples. The animal is an ovoid, hyaline sack, constricted anteriorly to a short cylindrical neck, which, when the corona is retracted is fluted, and the free edge is crenate; there is on each side a sub-dorsal groove. The corona has a circlet of ample cilia and at the dorsal border there is a conspicuous spatula-shaped apex which, seen laterally, is thin and turned downwards; on each side of this is what appears to be a stout incurved seta. The stomach is large and lobed of a rich yellowish brown. The mastax is an oblong clear globule, the apex of which is pushed to the front; the trophi inclosed appear to be virgate. The large ovoid, or nearly globular contractile vesicle, is situated near the posterior wall and nearly concealed by the stomach from above; it pulsates slowly, and, as it collapses, the extremity of the sack caves in and occupies in part the space it filled. The large red eye is circular, seen dorsally, and concavo-convex seen obliquely from below; dorsally viewed, there is a brilliant circular center, particularly when illuminated from the mirror below; seen laterally, there is disclosed a clear sphere placed in the center of the concave lower face; this seems to act like a lens.

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*July, 1888.

A good number were measured and but slight variation found; length equals $\frac{1}{236}$ inch, width $\frac{1}{370}$ inch.

Compared with *S. viridis,* which occurs sparingly in the same pond, there are many points of difference; it is quite colorless except the stomach, which occupies less of the body cavity than is the case in *Viridis,* so *Hyalinus* looks much like a miniature *Asplanchnia,* but the one apex determines its affinity to *Sacculus viridis* and, at the same time, is a character that separates it specifically. In dorsal view the two are very similar in outline, but from the side they are quite unlike, as *Hyalinus* presents about the same curve ventrally as dorsally, except that the neck of the flask is set obliquely downwards. *Hyalinus* much smaller than *Viridis.*

Figure 4 represents the animal seen from the side nearly. Figure 3 the appearance of the eye seen dorsally and laterally.

The only species of the Synchætadæ seen was one which could not be surely identical. It is nearer *Tremula* than any other described, and may prove to be that one. It is an animal of crystalline beauty.

Family 8. Triarthradæ.

Polyarthra platyptera, Ehrenberg.

Family 9. Hydatinadæ.

Hydatina senta, Ehrenberg.

Family 10. Notammatidæ.

Taphrocampa annulosa, Gosse.

This was not found at all common. I do not feel very sure of the identity of this strange creature; it certainly is distinct from the next, which was also rarely found.

Taphrocampa Saundersiæ, Gosse.

I have found this stumpy species rolled up so as to look very much like certain crustacean.

Notommata tripus, Ehrenberg.
Notommata lacinulata, Ehrenberg.
Copeus labiatus, Gosse.

This large, fine, free rotiferon was recently described from Sutton Park, Birmingham. I found it quite plentiful, crawling among Algæ in a variety of situations. The describer was certainly justified in calling it a "Noble Species," and there is satisfaction in having seen it as one of our own charming forms of microscopic life. Mr. Gosse describes its manner of biting the larger Algæ and sucking out the green contents. I have not seen it feeding thus, but found that the lower part of the stomach, which is transparent, was packed with the cellulose walls of algal cells from which the green contents had disappeared.

Furcularia forficula, Ehrenberg.

I find it inhabiting floccose tubes similar to the one described by Mr. Gosse, except shorter and filled with numerous, entangled, algal spores. He does not mention the fact that as the animal is gliding along its canal it suddenly stops, here and there, thrusts its curved toes through the floccose, and brings them forwards ventrally several times with a sudden jerk ; this is to pack more firmly the loose material ; the toes are often thrust out at the ends of the tubes and similar acts of construction are performed. It literally builds its shelter in the absence of hands by means of its sword-shaped toes.

Furcularia gracilis, Ehrenberg.
Furcularia longiseta, Ehrenberg.

FAMILY II. RATTULIDÆ.

Mastigocerca carinata, Ehrenberg.

I found an abundance of this common rotiferon, and with it, in about equal numbers, a form which could not be separated but which was of a beautiful ruby hue.

Cœlopus porcellus, Gosse.

With this I found what may be Mr. Gosse's *C. tenuior.* I could not make out the frontal spines as he has figured them.

Cœlopus brachyurus, Gosse.

FAMILY 12. DINOCHARIDÆ.

Dinocharis pocillum, Ehrenberg.

The species is rather more common than the next; the variety with very long spines occurs sparingly.

Dinocharis tetracis, Ehrenberg.

Scaridium longicaudum, Ehrenberg.

Stephanops lamellaris, Ehrenberg.

FAMILY 13. SALPINADÆ.

Salpina brevispina, Ehrenberg.

FAMILY 14. EUCHLANIDÆ.

Euchlanis triquetra, Ehrenberg.

FAMILY 15. CATHYPUADÆ.

Cathypna luna, Ehrenberg.

Monostyla lunaris, Ehrenberg.

Monostyla cornuta, Ehrenberg.

Monostyla bulla, Gosse.

FAMILY 16. COLURIDÆ.

Colurus obtusus, Gosse.

Colurus caudatus, Ehrenberg.

Metopedia lepadella, Ehrenberg.

Metopedia tritera, Ehrenberg.

FAMILY 17. PTERODINADÆ.

Pterodina patina, Ehrenberg.

I have found rarely, with this abundant and charming creature, what I take to be Mr. Gosse's *P. murcronata.* I think it is a distinct species, but have not had sufficient opportunity to decide.

FAMILY 18. BRACHIONIDÆ.

Brachionus rubens, Ehrenberg.
Brachionus Bakeri, Ehrenberg.
Noteus quadricornis, Ehrenberg.
Noteus conium, H. F. Atwood.

Mr. Atwood referred this species to *Brachionus;* I have given my reasons for referring it to *Noteus* in the Proceedings of the Pittsburgh meeting.